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Uniform Data System Standardizes Technical Computations and the Purchasing of Commercially Important Gases

Commercial and Government users of oxygen, nitrogen, argon and parahydrogen have encountered difficulties in costing, billing, and ordering these commercially important gases because different suppliers use slightly different values for the physical properties of the gases. Integrated tables of pressure, volume, and temperature for the saturated liquid, from the triple point to the critical point of the gases, have now been developed from sources which are considered to be the best available today. The tables should benefit both suppliers and purchasers, engineers and scientists.

Earlier efforts to standardize values for the physical properties of these gases included values of pressure, temperature, density for the normal boiling point (NBP), and standard temperature and pressure. The new tables also include a definition of the saturated liquid curve. Numerical values differ from the earlier selections by as much as 0.1%.

The tables include entries of integral values of temperature (in both degrees Kelvin (K) and degrees Rankine (R)), and pressure in both atmospheres and psia. Volumes and densities in three different units and a density ratio are tabulated for each entry. Estimates of the uncertainty of the tabulated data are given. Values are presented both in metric and practical units. The principal tables are merged into tables containing even values of pressure in both atmospheres and psia and even values of temperature in both K and R. The values of density in these tables are also presented in terms of (specific) volume and in terms of a ratio referred to the density at the NBP. Supplemental tables give values of density or volume at one atmosphere near room temperature. A third set of tables gives the uncertainties in the data. The

parts of the tables which lie in the practical range of pressures for liquid transfer are also illustrated in convenient graphical form. In addition, sample problems are worked out to demonstrate the ease in computing billings.

The advantages in using the new tables include the following:

1. Each of the compilations selected presents a consistent set of values from a single source for each fluid.
2. All available data, in particular the correlation of the single phase pressure-volume-temperature data with the saturation boundaries and the vapor pressure curve, have been considered, not only the value of the NBP.
3. The equations of state, in the form of computer programs, allow determination of values, both at liquid temperatures and at room temperatures.
4. The equations of state used present a consistent set of values for the saturation boundary as well as for the compressed fluid states. As flowmeter technology improves, an extension to the compressed fluid state will become imperative. Such a change can be accomplished without a further adjustment in the numerical values.

Note:

Requests for further information may be directed to:
Technology Utilization Officer
AEC-NASA Space Nuclear Propulsion Office
U.S. Atomic Energy Commission
Washington, D. C. 20545
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(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

Source: H. M. Roder, R. D. McCarty and
V. J. Johnson

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